Chapter 3: Description of Development

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3 Description of Development

3.1 Introduction

3.1.1 This Chapter describes the principal components of the Revised Coire Glas Pumped Storage Scheme (The Proposed Development). It also provides an overview of the likely construction methods, the approximate timescales over which construction would take place, and an overview of the operational and decommissioning phases of The Proposed Development. This Chapter is supported by a series of figures and appendices.

3.1.2 It should be noted that as all elements of The Proposed Development would be subject to detailed design, a similar Condition of Consent to that attached to the Section 36 Consent for The Consented Development would be required. That Condition stated:

Prior to the Commencement of Development, final design details for the following elements[1] of the Development must be submitted to the Planning Authority for Approval. The Planning Authority must consult with SEPA and SNH.

3.1.3 The primary function of The Proposed Development would be to extract, store and release energy to or from the electricity transmission system as required to help balance supply and demand for power at a national scale. The Proposed Development would operate by transferring water between Loch Lochy (lower reservoir) and a new reservoir created at Loch a' Choire Ghlais (upper reservoir) through the tailrace tunnel, underground cavern power station, high pressure tunnel and low pressure headrace tunnel. The Proposed Development would either be operated in the 'generating' mode, when electricity would be generated by releasing water from the upper reservoir through the pump-turbines and into Loch Lochy, or in the 'pumping' mode, when electricity is used to drive water through the pump–turbines in the other direction from Loch Lochy to the upper reservoir. The Proposed Development would also be capable of maintaining a 'stand-by' state of not generating or pumping (i.e. no significant water transfer is taking place through the underground cavern power station).

3.1.4 The key components of The Proposed Development are situated on Forestry Commission (Scotland) land to the south west of Laggan Locks, approximately 19 km to the south west of Fort Augustus. The Proposed Development comprises two main areas of work: the upper reservoir works comprising the upper reservoir, dam, upper control works, surge shaft and ventilation shaft; and the lower reservoir works comprising the lower control works, a jetty, administration building, and emergency access tunnel portal on the shore of Loch Lochy, linked by a series of underground tunnels and the cavern power station (see Figure 3.1: Scheme Overview and Plate 3.1). The lower slopes encompass a combination of woodland and commercial forestry whilst the upper area consists primarily of upland moorland with no active land use.

3.1.5 The upper reservoir works would be accessed off the A87 at White Bridge (Invergarry) utilising existing forestry tracks (some of which require to be upgraded) and the creation of

[1] The Condition lists all constructed elements of the project, access track and road upgrade requirements, and temporary works such as site establishment areas and borrow pits.

new tracks. The lower reservoir works, as well as the excavation of rock for the majority of the underground works, would be accessed off the A82 at North Laggan, following the minor public road and forestry tracks, both of which would require upgrading. A temporary haul road is also proposed to connect the lower reservoir works with the upper reservoir works, providing an opportunity to supplement rock quarried for dam construction with suitable tunnel spoil from the underground works. The viability of constructing this temporary haul road would be dependent on the scale of the project (i.e. 1500 MW or less), and the outcome of the final Spoil Management Plan (see Chapter 7: Spoil Management).

3.1.6 The principal components of The Proposed Development, which would provide a generating capacity of up to 1500 MW with an energy storage capacity of up to 30 Gigawatt Hours (GWh), are set out below (and shown on Figures 3.1, 3.2 and 3.3):

- Dam and Upper Reservoir - A new dam would be constructed to enable the storage of water, significantly increasing the size of the existing Loch a' Choire Ghlais to form the upper reservoir;
- Upper Control Works – An intake tower, screens, gate and gate shaft would be located within the upper reservoir to direct water into the headrace tunnel and underground waterway system;
- Underground Waterway System – A series of underground caverns and tunnels carrying water between the upper reservoir and lower reservoir, through the underground cavern power station;
- Cavern Power Station - A series of underground caverns containing reversible pump-turbines and motor-generators together with associated equipment such as transformers and switchgear;
- Surge Shaft – A surge shaft would be required to respond to the fluctuations in pressure within the tunnels;
- Ventilation Shaft – A ventilation shaft would be required to circulate fresh air through the underground access tunnel and cavern power station complex;
- Lower Control Works – Comprising two screened inlet / outlet structures and stop logs, positioned at the end of the tailrace tunnel below minimum water level. These structures would channel water in and out of Loch Lochy;
- Jetty – Constructed on the shore of Loch Lochy to facilitate use of the Caledonian Canal system for the transport of heavy equipment and materials, and the removal of tunnel spoil;
- Administration building - An above ground administration and workshop building required for day to day operational and maintenance tasks; and
- Access Tunnels – A main access tunnel and an emergency access tunnel would be provided for accessing the underground power plant, close to the shore of Loch Lochy.

3.1.7 An indicative cross section of The Proposed Development is provided in Plate 3.1. Visualisations of The Proposed Development are illustrated in Figures 3.4 – 3.7.

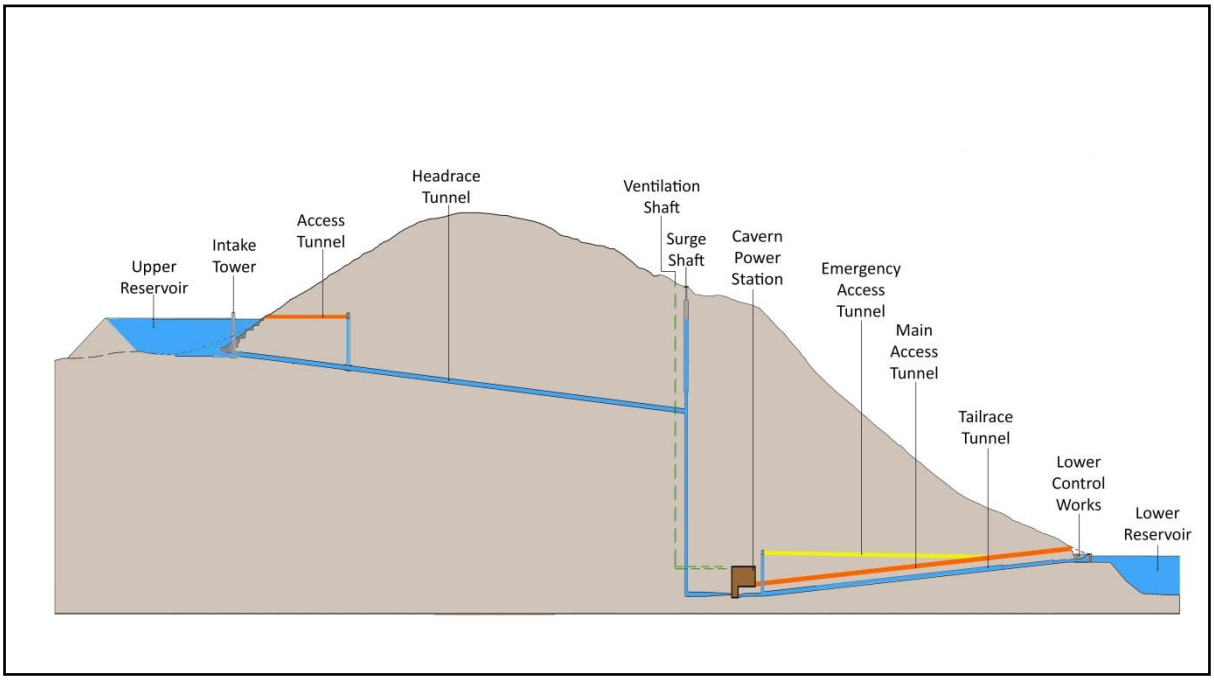
3.1.8 In addition to the above, it is anticipated that there would be a need for site establishment and lay down areas in the vicinity of the upper reservoir, surge shaft and lower reservoir works, as well as in a suitable location within the forest area near White Bridge (Invergarry). Borrow pits are required to provide aggregate to supply sufficient rock to construct suitable access tracks (see Section 3.9). A Borrow Pit Screening Assessment is included as an appendix to the EIA Report (see Appendix 14.2). Indicative site establishment areas and borrow pits are identified on Figure 3.1: Scheme Overview.

3.1.9 The majority of spoil from the tunnels, surge shaft, ventilation shaft and cavern chambers would be removed via the tunnel portals near the shore at Loch Lochy. Excavated spoil from the underground works would be re-used, where possible, in the construction of the dam and within the localised area of construction works wherever feasible. Once the material re-used at the dam and the processed spoil used for construction aggregate has been accounted for, it is anticipated that the quantity of spoil generated by The Proposed Development will result in approximately 3.9 million tonnes of surplus material at the lower reservoir works which will require on-site re-use or onward transportation for re-use off site. This estimate is based on the proposed 1500 MW scheme (i.e. the 'worst case scenario' in terms of the generation of excavated materials). It should be noted that spoil quantities would be reduced were a smaller capacity scheme developed. This is discussed further in Chapter 7: Spoil Management.

3.1.10 The operation of The Proposed Development would require the modification of Mucomir barrage and hydroelectric power station at Gairlochy. Control of Loch Lochy water levels is currently determined by the operation of Mucomir Hydroelectric Power Station (Mucomir) but the operation of a pumped storage hydro scheme on the loch would take priority over Mucomir. As such, Mucomir Barrage and Power Station would be modified and a new operating regime determined to allow the necessary control of Loch Lochy levels. This is discussed further in Chapter 6: Water Management.

3.1.11 Variations in Loch Lochy water levels are expected to be more frequent than they are at present during operation of The Proposed Development. There would also be a modification in the flow characteristics of Allt a' Choire Ghlais downstream of the proposed dam due to the operation of the scheme (see Chapter 6: Water Management). Environmental releases (compensation and/or hands-off flows) would be provided to maintain aquatic habitat in accordance with the requirements of SEPA and the appropriate stakeholders.

Plate 3.1: Indicative Cross Section



3.1.12 The following section describes the principal scheme components in more detail, all of which would be subject to detailed design.

3.2 Dam and Upper Reservoir

3.2.1 The proposed dam would be located at approximate grid reference NN 236 956 (centre point), as shown on Figure 3.1: Scheme Overview.

3.2.2 The site of the proposed dam lies within a 'bowl' shaped valley with moderately steep abutment slopes (see Plate 3.2). The maximum dimensions of the new dam would be a crest length of approximately 700 m with an estimated height above ground level of approximately 92 m. The volume of water used for power generation would be up to 25,900,000 m^3. An indicative maximum operational draw down of approximately 64 m is anticipated within the upper reservoir. For the purposes of assessment within this EIA Report, the assumed maximum water level within the upper reservoir would be 558.1 m OD and the assumed minimum water level would be 494 m OD. These levels would be subject to detailed design. The maximum surface area of the upper reservoir behind the dam would be approximately 0.63 km^2. The dam would have facilities for compensation water release and an emergency drawdown facility. A 4 m wide access road would run along the crest of the dam, supported on the upstream side by a reinforced concrete parapet wall.

Plate 3.2: View of the Dam and Upper Reservoir area

3.2.3 For reasons of reservoir safety, the proposed design of the dam includes a spillway sized for the calculated natural flood events at the dam site. It is anticipated that natural floods would be relatively small in magnitude given the ratio of the reservoir surface area (approximately 0.63 km²) to the catchment as a whole (3.04 km²).

3.2.4 A compensation flow discharge would be released to Allt a' Choire Ghlais (see Chapter 6: Water Management).

3.2.5 The upper control works would be located within the upper reservoir footprint and would comprise a concrete intake tower, screens, gate and gate shaft to direct water into the headrace tunnel and underground waterway system. The intake tower would be linked to the reservoir edge by a vehicular bridge. The Design Statement (see Appendix 3.1) provides more information on the design and finish of the intake tower.

3.2.6 A bottom outlet system is required in order to provide a means of releasing the compensation flow discharge to Allt a' Choire Ghlais and to provide an alternative means of completely dewatering the reservoir. It is likely that forced air ventilation will be required to ensure a safe environment for personnel access within the culvert.

3.2.7 A downstream valve structure will be located at the foot of the dam, accessed from a spur off the main access track to the dam. The final form of the structure is to be finalised, subject to detailed design, but could either take the form of an above ground or a partially buried structure. A small parking area to cater for routine inspection and maintenance and an external stand-by generator compound would also be provided.

3.2.8 Emergency power for the facilities at the upper reservoir would be provided by a standby diesel generator, likely to be located just inside the access tunnel. The transformer associated with the power supplies and emergency generator would be housed in a fenced

enclosure, with suitable blast walls and a metal grill gate. This would also be located just inside the access tunnel.

3.2.9 The upper reservoir dam would be a rock-fill embankment with an upstream concrete face. Over the whole embankment foundation area topsoil and peat would be removed so that an appropriate rock foundation is established. At the plinth foundation, excavation would be accomplished by drilling and blasting the rock to form a clean and appropriate foundation for the plinth. Peat will also be stripped from within the upper reservoir footprint. It is desirable to remove peat from the upper reservoir basin in a controlled manner during the construction of the works. However, the extent of peat removal within the upper reservoir basin during construction of the works is indicative at this stage, with peat management options included in the Draft Peat Management Plan (included as Appendix 14.5). The detailed design of the works within the upper reservoir basin would be developed by the contractor and methods for stripping, storing and re-use of peat will be included in a Final Peat Management Plan, developed by the contractor.

3.2.10 Rock to construct the dam embankment would be sourced from a quarry established within the upper reservoir area. The creation of a temporary haul road to connect the lower reservoir works with the upper reservoir works (see Section 3.7) would provide an opportunity for quarried rock from the upper reservoir to be supplemented if feasible by suitable tunnel spoil from spoil excavated from the underground works. Further detail is provided in Chapter 7: Spoil Management. Rock would also be required for concrete operations at the dam, the upper control works and the headrace tunnel. By producing the rock materials required to construct the dam within the upper reservoir area and from the underground works, offsite hauling of rock fill and aggregates would be minimised as far as is reasonably practicable. The upper reservoir area is of sufficient size to establish a rock crushing, screening and washing plant, as well as a concrete batch plant, as required.

3.2.11 It is not anticipated that the existing Loch a' Choire Ghlais would be drained during construction of the dam. However, a diversion structure would be required to divert river flow and floods around the working area of the dam during construction.

3.2.12 As far as practicable, temporary works at the dam site would be established within the upper reservoir in order to minimise disruption to adjacent areas, during construction. However, it is likely that a site establishment and laydown area would also be required at the dam site located outwith the upper reservoir footprint.

3.3 Underground Waterway System

3.3.1 The underground waterway system would consist of a series of underground caverns and tunnels carrying water between the upper reservoir and lower reservoir through the cavern power station. All underground works are likely to be constructed using drill, blast, muck and haul techniques.

3.3.2 A summary of each of the components of the underground waterway system is provided below (reference should also be made to Figure 3.1: Scheme Overview and Plate 3.1):

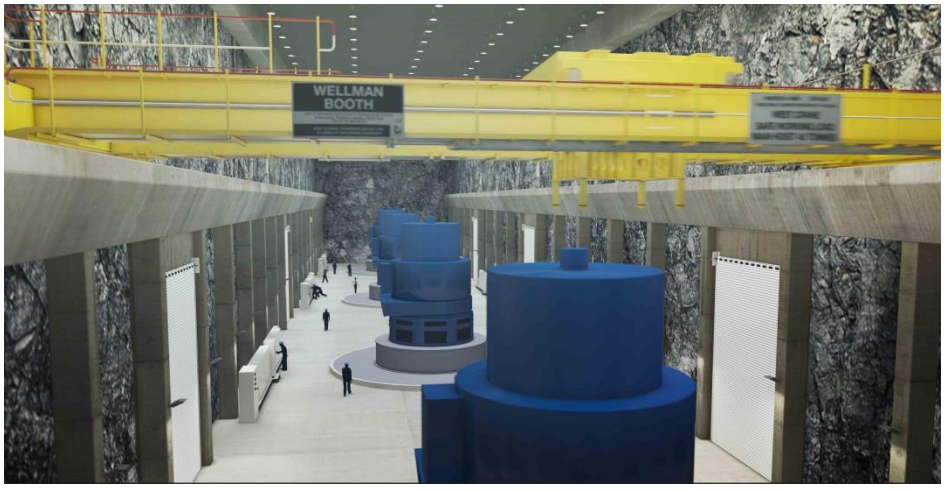
- Upper Control Works – Located on the south eastern reservoir rim, indicatively shown 200 m upstream of the main dam axis. Comprising the intake tower, screens and a gate shaft, provided downstream of the intake to house the intake gates and the stop log panels necessary to perform maintenance. Access to the gate shaft would be through a short access tunnel high on the right abutment of the dam;
- Headrace Tunnel – a low pressure tunnel leading from the upper reservoir to the underground cavern power station via a high pressure shaft;
- Surge Shaft - Designed to respond to fluctuations in pressure within the headrace tunnel;
- Ventilation shaft – Required to aid the circulation of fresh air through the underground access tunnel and powerhouse complex;
- High Pressure Shaft / Tunnel – the headrace tunnel transitions to a high pressure shaft and high pressure tunnel which would connect to the individual unit penstocks via a series of underground steel bifurcations forming a manifold;
- Tailrace Tunnels – the draft tube of each pump-turbine unit would be connected to a common tailrace tunnel to convey water between the cavern power station and the lower reservoir, with surge chamber(s) provided to respond to fluctuations in pressure within the tailrace tunnel; and
- Lower Control Works – the tailrace tunnel would transition to the waters of Loch Lochy via concrete inlet / outlet structures, which would be equipped with screens and screen handling equipment.

3.4 Cavern Power Station

3.4.1 The underground cavern power station complex would house the reversible pump-turbines, motor generators, transformers and other associated equipment.

3.4.2 The power station complex would include three main caverns or galleries and a number of other subsidiary tunnels and galleries. The main caverns include a machine hall, a transformer hall and a tailrace tunnel surge chamber gallery. Plate 3.3 provides an indicative illustration of the underground cavern power station complex.

Plate 3.3: Indicative illustration of the Underground Cavern Power Station



3.5 Surge Shaft and Ventilation Shaft

3.5.1 The surge shaft would be located at approximate grid reference (NN 250 946) as shown on Figure 3.1: Scheme Overview. It is likely that the surge shaft would be constructed by a raise boring machine, with the rock being extracted at the lower reservoir area. A ventilation shaft from the cavern power station complex would also be required and would daylight close to the surge shaft. Due to the remote location of the surge shaft and ventilation shaft, it is anticipated that a temporary satellite office / mess facility would be established during the construction works at the surge / ventilation shaft site to service the workforce. This would be fully reinstated upon completion of the construction works. Access requirements to the surge shaft are discussed in Section 3.7.

3.5.2 It is anticipated that the above ground element of the structures would be carefully designed to ensure that they are assimilated within the surrounding landscape as far as possible, whilst ensuring public safety and operational security, as has been successfully established at existing hydroelectric schemes in the Scottish Highlands (see Plate 3.4 below).

Plate 3.4: Example of a Surge Shaft

3.6 Lower Reservoir Works

3.6.1 The lower reservoir works at Loch Lochy comprise all works at the lower reservoir, including administration building, jetty, main and emergency access tunnel portals, and the lower control works (as shown in Figures 3.1 and 3.2). A photograph of the general area of Loch Lochy where the lower reservoir works are proposed is included in Plate 3.5.

3.6.2 Excavation of the majority of underground works (with the exception of the headrace tunnel, surge shaft and ventilation shaft) would commence at the lower reservoir area, with all excavated spoil being brought through the main access tunnel to the jetty for onward transportation and re-use.

Plate 3.5: Area of proposed Lower Reservoir Works

3.6.3 Rock cuts would be required in order to facilitate excavation of the underground works and the creation of the lower control works platform and jetty and tunnel portals.

3.6.4 The main visible components within the lower reservoir works are described further below.

Administration Building

3.6.5 For Health and Safety reasons, day to day operation and maintenance of The Proposed Development would be performed as much as possible using surface facilities. To that end, an administration building would be constructed at the portal to the main access tunnel.

3.6.6 Within the administration building the main station control room would be located, together with conference room, offices, storage room, lunch room, kitchen and toilet facilities. This building would also contain workshops for maintenance work and on-site repairs to removable components of the underground cavern power station equipment where practicable.

3.6.7 The conceptual design of the administration building is presented in Appendix 3.1: Design Statement. The final size, design and layout of the administration building would be subject to detailed design.

Jetty

3.6.8 To facilitate use of the Caledonian Canal system for the transport of heavy equipment and materials, and the removal of tunnel spoil, a jetty would be constructed on the shore of Loch Lochy. The jetty would be sized to accommodate barges capable of transporting the tunnel spoil off site (see Chapter 7: Spoil Management) and would need to facilitate storage and laydown areas for handling of large quantities of excavated rock. Therefore a jetty approximately 200 m in length and allowing a minimum alongside water depth of approximately 5 m is proposed. The jetty is anticipated to extend approximately 20 m into

Loch Lochy (from low water level). The final detail of the jetty will be subject to detailed design.

3.6.9 The transformers and other major equipment would be moved using roll-on, roll-off technology or by specially planned lifting operations. A mobile truck mounted crane would be used to offload plant and materials as required. No permanent crane would be installed.

3.6.10 During construction, measures would be undertaken to ensure the public safety of Loch Lochy users.

3.6.11 At the end of construction it is anticipated that some of the jetty would be removed, leaving the remaining structure for use during the operation of the scheme. The area around the permanent jetty could be landscaped and planted to minimise visual impact, as illustrated in Figure 3.2: Indicative Layout of Lower Reservoir Works.

Lower Control Works

3.6.12 The lower control works would comprise two concrete inlet / outlet structures positioned at the end of the tailrace tunnels. These structures would house the necessary screen arrangements and be shaped to smoothly channel the water in and out of Loch Lochy at low velocities.

3.6.13 The tailrace tunnels and lower control works would be below minimum water level but part of the structures would be visible. The finished structures frontage would be approximately 200 m long and 17 m in height (mostly underwater - 1.5 m of the total height would extend above the existing maximum Loch Lochy surface level). The screen area would be set back from the existing high water line, with the training walls (likely to be underwater) extending approximately 10 m from the natural shoreline into Loch Lochy.

3.6.14 The majority of construction at the lower control works would take place in dry conditions using drill, blast, muck and haul techniques. The tailrace tunnel portals would be formed close to loch elevation, positioned behind a natural cofferdam of unexcavated rock to minimise the amount of underwater construction work. Excavation of the tailrace tunnels is likely to be commenced from the cavern power station end.

3.6.15 The tailrace structures would require smolt screens, likely to be vertical bar screens with a spacing of 12 mm and a maximum approach velocity limit of 300 mm/sec in front of the screens.

3.6.16 A hard standing area would be required on-shore to allow for cleaning of the smolt screens and maintenance of the lower control works. Opportunities exist for landscape mitigation, including mounding, planting or other screening (such as walls) in this area to minimise visual impact (see Figure 3.2: Indicative Layout of Lower Reservoir Works and Appendix 3.1: Design Statement).

Other Building Works

3.6.17 Other building works at the lower reservoir works would include portals to the access tunnel and the emergency access tunnel. The external appearance of the portals would be finished to a high standard (see Appendix 3.1: Design Statement) and would be landscaped

to reduce adverse visual impacts. They would incorporate gates or doors for emergency egress and access by vehicles.

3.6.18 During construction, outdoor area lighting would be provided in the parking areas, construction areas, along main access routes, and at the main project structures, as required. Once operational, lighting would be provided at key areas, such as the lower control works and would only be used occasionally, during essential operational and maintenance activities.

3.7 Access Tracks

3.7.1 Access during the construction and operation of The Proposed Development would utilise existing public roads and forestry tracks where possible. The construction of new tracks to the upper reservoir works would also be required. Generally track widths would be the minimum necessary to provide safe and practical access to that particular location. The indicative track alignments shown on Figure 3.1: Scheme Overview are based on the information available at this time and may be subject to further micro-siting following more detailed design and site investigations. Furthermore, in certain places, tracks may be slightly wider or narrower than the widths indicated here. Details of access requirements are described below (see also Plate 3.6):

- Use of the West Loch Lochy Road (known locally as the Kilfinnan Road) from the A82 through North Laggan to Kilfinnan Farm. This road would require widening to approximately 8 m to facilitate use by construction vehicles and the potential upgrade or replacement of three of the existing bridges along this route. Upon completion, this section of road would be narrowed to a width sufficient to maintain operational and maintenance activities. For the purposes of the EIA Report, this width is assumed to be approximately 6 m. The proposed improvement works would be designed to ensure that access for all existing households and businesses along this road would be maintained during the construction and operation of the scheme;
- Use of existing forestry track(s) from Kilfinnan Farm to the lower reservoir works. The existing forestry track would require widening to approximately 8 m during construction, and works would include the removal of some coniferous forestry to facilitate the widening. Upon completion, this section of track would be reinstated to a width sufficient to maintain operational and maintenance activities. For the purposes of the EIA Report, this width is assumed to be approximately 6 m;
- Use of existing forestry track from the A87 at White Bridge (Invergarry) to edge of forestry plantation (to the west). The existing forest track would require widening to approximately 8 m during construction, but would be reinstated post construction to the minimum width sufficient to enable heavy goods vehicles to access the dam and upper reservoir for maintenance purposes. This is the primary means of access to the upper reservoir. The removal of some coniferous forestry during construction is anticipated to facilitate widening of the existing tracks, along with strengthening of two bridges along this section of track; with one of these being White Bridge. However, should investigations demonstrate that strengthening the existing bridge be unsuitable, the construction of a new bridge would be required;

- Creation of new track from edge of forestry plantation to dam site. This is a continuation of the primary means of access to the upper reservoir. The new track would need to be approximately 8 m wide during construction, but would be reinstated post construction to the minimum width sufficient to enable heavy goods vehicles to access the upper reservoir for maintenance purposes. Tracks to the intake tower and the valve chamber would also be required from the dam. These track widths would be up to 8 m during construction, narrowed to approximately 4 m on completion of construction activities;
- To enable access for construction of the surge shaft and ventilation shaft, a new track, approximately 6 m wide would be required to allow the machinery required to construct the shafts to access the site. It is anticipated that due to the gradient of the slope to the top of the surge shaft, safety bunds may be required. Upon completion, the track could be reduced in width to a land rover track (approximately 3 m in width with passing places) for occasional use by maintenance vehicles; and
- Creation of a temporary haul road to connect the lower reservoir works to the upper reservoir and dam, providing an opportunity to supplement rock quarried for dam construction with suitable tunnel spoil from the underground works. The temporary haul road would require to be approximately 8 m wide with passing places to enable two-way traffic and it is anticipated that due to the gradient of the slope, safety bunds may be required. The temporary haul road would be reinstated and re profiled into the landscape as much as practicable once construction works are complete. The viability of constructing this temporary haul road would be dependent on the scale of the project (i.e. 1500 MW or less), and the outcome of the final Spoil Management Plan (see Chapter 7: Spoil Management).

3.7.2 Where access roads form part of a public road or interface with public roads (i.e. at access points) the road standards would be agreed with Transport Scotland and The Highland Council.

3.7.3 In the vicinity of the lower reservoir works, the existing forestry roads are incorporated in the Great Glen Way. Where required for safety, alternative provision would be made to separate walkers and cyclists from the works, constructed to the same standard as the existing Great Glen Way. Any such provisions would be agreed with the local Access Officer in the form of an Outdoor Access Management Plan, and constructed in accordance with the requirements of the Land Reform (Scotland) Act 2003 where this does not conflict with the health and safety requirements of the construction site. Alternative access provision would be constructed at commencement of works in the area and where appropriate could remain in place as a permanent realignment to this section of the Great Glen Way.

Access Track Construction

3.7.4 The upgrade of Kilfinnan Road would occur in advance of the core construction period to facilitate the commencement of underground works at the lower reservoir (see Section 3.13).

3.7.5 Site access tracks would typically be constructed with locally (on site) won graded rock from borrow pits and, where necessary, geotextiles with the surface course comprising of a durable unbound graded rock surfacing material.

3.7.6 Depending on local ground conditions, access tracks to the upper reservoir works would be constructed using a combination of 'floating track' or 'cut track' designs:

- Generally, a 'floating track' design does not involve excavation and would likely be utilised on the site in areas where peat depth is greater than 1 m, although this would be dependent on the specific circumstances at a particular location. Geotextile material would be laid onto the unbroken existing surface at a width to suit the track. Layers of crushed stone would then be laid on the geotextile to form a track capable of supporting construction plant. This type of track construction is typically used in peaty areas across Scotland, including constructed wind farm developments and public roads. The benefits of the floating track design are that it allows access track construction on soft terrain and does not require excavation of deep peat as the surface layer is not broken, resulting in reduced peat volumes for re-use across the site. There is minimal disruption of the sub-surface flow of water within the peat body, and no new channels are formed by which water can drain from the peat mass; and
- In areas of shallow or no peat (0-1m), a 'cut track' design would likely be utilised for which the topsoil and peat would be stripped to expose a suitable bearing strata on which to build the track. The track would then be constructed by placing and compacting suitable crushed rock (obtained from suitable on-site borrow pits) to the required level. Given the variable and undulating topography across the site, earthwork cuttings and embankments would be required to achieve the required gradients for tracks and crane hardstandings. The upper soil/peat horizon, together with any vegetation, would be placed to one side for later reinstatement, if appropriate.

3.7.7 Peat depth across the site, confirmed through peat probing, is generally shallow (<1m) (see Chapter 14: Geology and Water Environment, and relevant appendices).

3.7.8 Where appropriate, peat and soil from excavations on site would be utilised for reinstatement along both sides of the track verges and allowed to regenerate naturally. Further details are provided in Appendix 3.3: Draft CEMP and Appendix 14.5: Draft Peat Management Plan.

Access Track Drainage

3.7.9 Construction of site access tracks requires robust drainage. Run-off from the access tracks would be shed via a crossfall into track side ditches and settlement lagoon/ponds to attenuate flows and remove sediments before discharging to land. Further details are provided in Appendix 3.3: Draft CEMP.

3.7.10 Cross drains would be installed at regular intervals to prevent flooding / surcharging of trackside drainage and maintain hydraulic pathways. As far as possible, these would coincide with naturally occurring drainage channels.

Plate 3.6: Existing Access Tracks and Roads

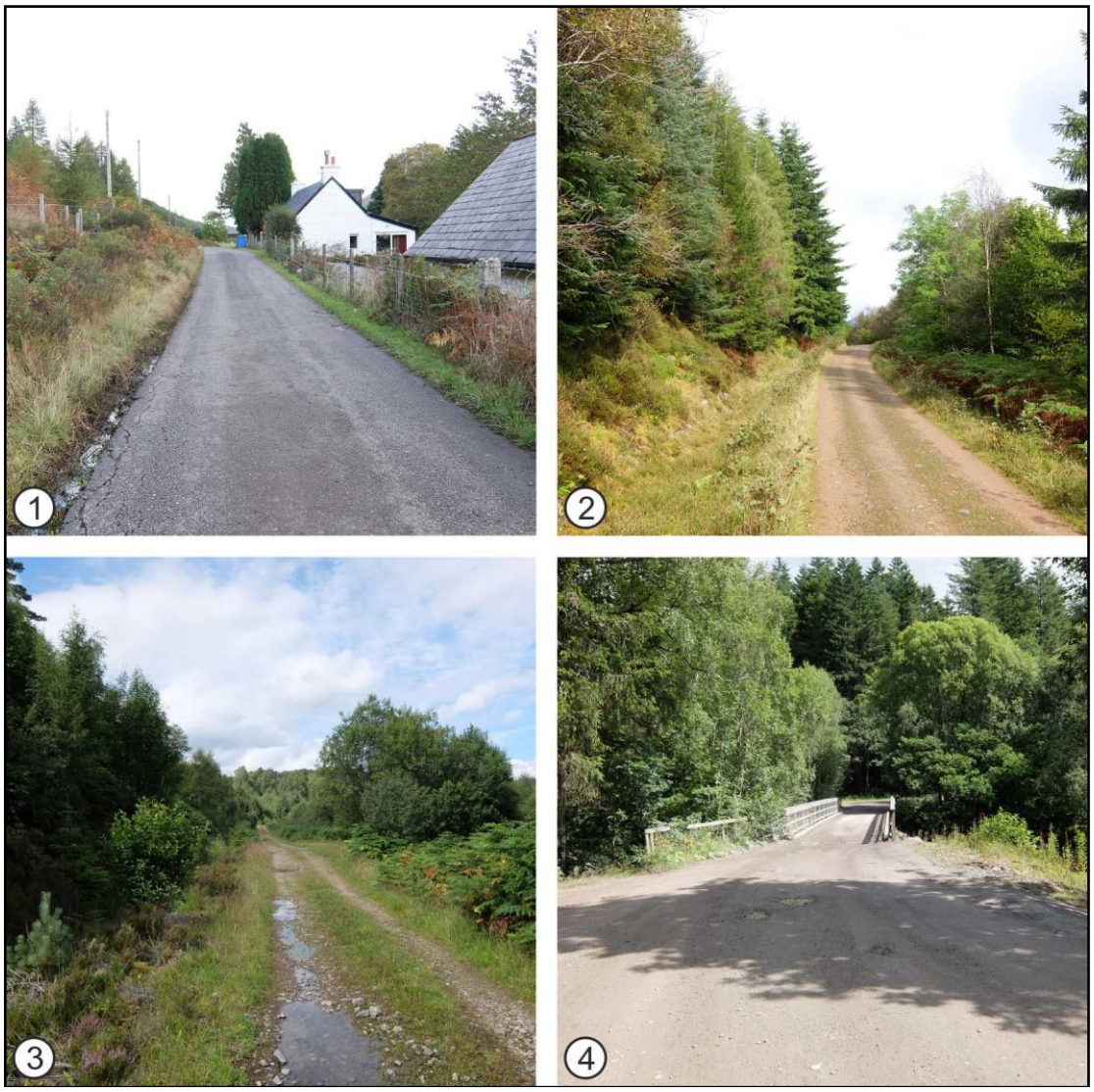


Photo Locations 1: Existing public road (Kilfinnan Road) from A82 through North Laggan to Kilfinnan Farm. 2: Existing forest track from Kilfinnan Farm to the lower reservoir works. 3: Existing Forest Track from White Bridge to edge of Forest Plantation. 4: Existing bridge at White Bridge.

3.8 Spoil Management

3.8.1 The majority of spoil excavated from the tunnels, surge shaft, ventilation shaft and cavern chambers would be removed via the tunnel portals near the shore at Loch Lochy. Excavated spoil from the underground works would be re-used, where possible, in the construction of the dam and within the localised area of construction works wherever feasible. However, it is anticipated that the quantity of spoil generated by The Proposed Development will result in approximately 3.9 million tonnes of surplus material at the lower reservoir works. This will require on-site re-use or onward transportation for re-use off site. A further 0.6 million tonnes (approximately) of spoil excavated from the underground works would be used for aggregate at the lower reservoir works. These spoil quantity estimates are based on a 1500 MW scheme (i.e. the 'worst case scenario' in terms

of the generation of excavated materials). It should be noted that spoil quantities would be reduced were a smaller capacity scheme developed.

3.8.2 Options for the transport and re-use of spoil material off site are discussed in Chapter 7: Spoil Management.

3.8.3 As discussed in paragraph 3.1.5, 3.2.10 and Section 3.7, in order to further reduce potential impacts on the road network and waterways, a new temporary haul road to connect the lower reservoir works area to the upper reservoir and dam, provides an opportunity to supplement rock quarried for dam construction with suitable tunnel spoil from the underground works. The viability of constructing this temporary haul road would be dependent on the scale of the project (i.e. 1500 MW or less), and the outcome of the final Spoil Management Plan (see below).

3.8.4 Due to the complexity of the construction programme for the project, the timescales for future site investigation and detailed design, and the need to allow the construction contractor some flexibility in their working methods, it is not feasible to confirm potential spoil re-use options at this time. Further analysis would be required post consent to fully explore spoil re-use and transportation options prior to construction.

3.8.5 As agreed for The Consented Development, it is anticipated that a Section 36 Condition of Consent would cover the implementation of the transportation and re-use of spoil, to enable the Applicant to assess the final spoil volume, identify potential receptor sites and the best practicable environmental option for transporting the excavated spoil to these locations. It is proposed that a detailed report evaluating options for the use of excavated spoil material would be outlined in a Spoil Management Plan prior to commencement of the main underground works (see Chapter 7: Spoil Management). This study would be undertaken in full consultation with The Highland Council and other statutory bodies and stakeholders. For the purposes of assessment within this EIA Report, approximately 3.9 million tonnes of excavated spoil material is assumed as the worst case scenario.

3.9 Site Establishment

Site Establishment Areas

3.9.1 During construction there would be a need for site establishment and lay down areas in the vicinity of the upper reservoir, the forestry at White Bridge (Invergarry), the surge shaft and the lower reservoir works, as shown indicatively on Figure 3.1: Scheme Overview. The final arrangement for these areas, and the obtaining of any required consents, would be the responsibility of the successful contractor to allow them flexibility for their works.

Borrow Pits

3.9.2 To facilitate access to the upper reservoir works, site access tracks would need to be constructed from locally won graded rock extracted from borrow pits located within the vicinity of the proposed works. The exact location of borrow pits would be dependent upon site surveys with respect to availability of suitable material and proximity to where it is required. A Draft Borrow Pit Screening Report (Appendix 14.2) has been undertaken to identify potential borrow pit areas (as shown indicatively on Figure 3.1: Scheme Overview).

3.9.3 It is anticipated that of the total excavated spoil, it is estimated that 20% would be removed from the tunnel portal at the upper reservoir and will be used in dam and track construction. As described in Section 3.8, once the material re-used at the dam and the processed spoil used for construction aggregate has been accounted for, it is anticipated that the quantity of spoil generated by The Proposed Development will result in approximately 3.9 million tonnes of surplus material at the lower reservoir works which will require on-site re-use or onward transportation for re-use off site. Chapter 2: Consideration of Alternatives (Section 2.6) considered the alternatives available for using excavated spoil in construction of the dam, concluding that to do so would require the construction of a temporary haul road.

3.9.4 Further analysis would be required post consent to fully explore spoil re-use and transportation options prior to construction, including the re-use of spoil in dam and track construction. However, given the programming, economic, environmental and practical constraints, there is a clear requirement for borrow pits as part of this project to facilitate the construction of access tracks.

Forestry

3.9.5 To facilitate construction of The Proposed Development there will be a requirement to fell areas of commercial forestry. Felling is anticipated in the vicinity of the lower reservoir works, and at White Bridge (Invergarry) to facilitate access, site establishment and borrow pit requirements. Further detail is provided in Chapter 21: Forestry.

3.10 Workers Camps

3.10.1 The anticipated construction programme for the core civil engineering construction period would last up to seven years. During this period, the workforce would typically be around 500 on average but this would vary throughout the construction period. This includes site based supervisory/management staff and construction workers. There would also be workers and visitors travelling to site by car on a daily basis during the construction period.

3.10.2 It is anticipated that construction workers would be accommodated in workers camps, either on site, or off site within the general vicinity of the project. The final arrangement for this, and the obtaining of any required consents, would be assessed during design development and procurement.

3.11 Site Traffic

3.11.1 Construction traffic to the upper reservoir works would take access from the A87 at White Bridge (Invergarry), before utilising existing forestry tracks (to be upgraded) and new tracks to the dam site and surge / ventilation shafts. Construction traffic to the lower reservoir works would take access from the A82 at North Laggan, and then along the existing public road and forestry tracks (both to be upgraded). All operational or maintenance traffic would also utilise these access routes (reduced in width post construction), although it is anticipated that the majority of this traffic would require access to the lower reservoir works only.

3.11.2 The Caledonian Canal system would be used as far as practicable in the delivery of various equipment and materials for the project, as well as in the transportation of tunnel spoil

(see Chapter 7: Spoil Management). This method was used for some equipment and materials delivery during the construction of Foyers Pumped Storage scheme, located on the banks of Loch Ness.

3.11.3 To reduce road and / or canal traffic volumes during the period of dam construction, a temporary haul road to connect the lower reservoir works area to the upper reservoir and dam is proposed. The temporary haul road provides an opportunity to supplement rock quarried within the upper reservoir, with suitable tunnel spoil from the underground works, for dam construction. The viability of constructing this temporary haul road would however be dependent on the scale of the project (i.e. 1500 MW or less), and the outcome of the final Spoil Management Plan (see Chapter 7: Spoil Management).

3.11.4 An estimate of total construction traffic generation, and an assessment of potential effects of this on the local road network, is included in Chapter 16: Traffic and Transport.

3.11.5 During operation, The Proposed Development would be manned from the administration building at the lower reservoir. It is estimated that an average of 20 staff would be employed at the facility on a permanent basis, requiring daily access. Infrequent access by heavier vehicles for maintenance would occur as required.

3.12 Environmental Management during Construction

3.12.1 It is proposed that construction method statements for the construction of The Proposed Development will include the requirements of the Construction Environmental Management Plan (CEMP) which would apply to all construction activities required as part of the proposals. In particular, the CEMP would specify conditions relating to protection of habitats and species, pollution prevention and the means by which site monitoring would occur. The final site-specific CEMP would be drawn up by the Applicant, in consultation with The Highland Council, Scottish Environment Protection Agency (SEPA), and Scottish Natural Heritage (SNH), once planning permission had been obtained and the contractor appointed. A Draft CEMP is included in Appendix 3.3.

3.12.2 A Site specific Stage 2 Peat Management Plan would be prepared at pre-construction stage, following further site and ground investigation works, which would detail further how peat will be managed and re-used on site. This would be agreed in consultation with The Highland Council and SEPA. A Draft Peat Management Plan is included in Appendix 14.5.

3.12.3 A schedule of mitigation is included in Appendix 3.2 which consolidates and cross references all of the suggested mitigation measures documented in this EIA Report to minimise or off set potential environmental effects.

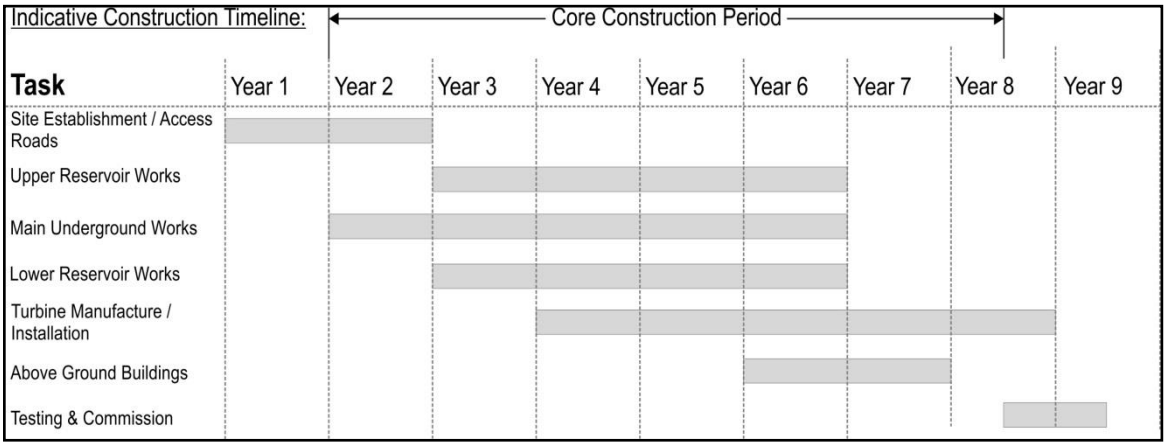
3.13 Construction Programme / Hours of Working

3.13.1 It is anticipated that the main civil engineering construction period would last up to seven years (see Plate 3.7 below), subject to the successful contractors approach. This construction period is based on a 1500 MW scheme (i.e. the ‘worst case scenario’ in terms of the construction programme due to the size of the underground caverns and tunnels). It is anticipated that the construction programme could be reduced were a smaller capacity scheme developed.

3.13.2 For the purposes of this EIA Report, it is assumed that the construction start date indicated in Plate 3.7 (Year 1) is 2021.

3.13.3 Normal construction shifts would generally apply for the surface works but these would be subject to some variation to suit the work in hand and weather conditions, to be agreed with The Highland Council. It is anticipated that underground operations would need to continue 24 hours a day, seven days a week.

Plate 3.7: Indicative Construction Timeline



3.14 Operational Activities

3.14.1 The Proposed Development would be manned, with the majority of operations being controlled from the administration building. Regular visits would be made to inspect and maintain structures along the following lines:

- Daily visits to the cavern power station for routine operational and maintenance purposes;
- Weekly visits to the dam, for routine operational and maintenance purposes;
- Non routine and scheduled major maintenance tasks would be carried out at longer intervals as required. These tasks could potentially extend to several weeks/months in exceptional circumstances;
- Periodic inspection of the underground tunnel works and statutory inspections of the upper dam and ancillary works; and
- As required maintenance of the access tracks and other infrastructure as noted during routine visits to the site.

3.15 Decommissioning

3.15.1 With proper maintenance The Proposed Development should remain functional indefinitely. If The Proposed Development ceases operation, decommissioning would take place and the site would be restored as follows:

- Underground tunnels would be sealed;
- Generation plant would be removed;
- Where removal of infrastructure would result in more damage than leaving in place, they would be left in-situ; and
- Disturbed ground would be reinstated.

3.15.2 Full details of the decommissioning plan would be agreed with the appropriate authorities and landowners prior to any decommissioning works commencing.